

WHAT IS CLAIMED IS:

1. A mobile terminal for determining when a user should be stimulated toward
5 an awake state, comprising:
a receiver for receiving a sleep descriptor signal indicative of at least one
sleep characteristic of the user; and
a signal processing module for processing said sleep descriptor signal,
wherein said signal processing module is arranged to provide, at least partly
10 in response to the sleep descriptor signal, a stimulation signal, and
wherein the mobile terminal is also usable for communication by the user in
the awake state.
2. A mobile terminal according to claim 1 wherein said stimulation signal is an
15 audible signal.
3. A mobile terminal according to claim 1 wherein said stimulation signal is a
radio signal for activating a stimulating unit.
- 20 4. A mobile terminal according to claim 1 wherein said signal processing
module is arranged to provide said stimulation signal at least partly on the basis of
at least one criterion adjustable by the user.
5. A mobile terminal according to claim 4 wherein said at least one criterion
25 adjustable by the user are indicative of a time interval.
6. The mobile terminal of claim 1,
wherein the mobile terminal is configured to handle an incoming call at least
partly depending upon the at least one sleep characteristic indicative of whether the
30 user is in a deep sleep or a shallow sleep, to give the user protection from being
awoken out of the deep sleep.

7. The mobile terminal of claim 1, further comprising a slumber indicator for indicating to at least one other person whether the user is awake or in a deep sleep or a shallow sleep, based at least partly on the at least one sleep characteristic.

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8. The mobile terminal of claim 1, comprising a radio frequency transmitter, responsive to the stimulation signal, for providing a radio signal that contributes to causing said user to be awoken,

wherein the radio signal provided by said radio frequency transmitter is for causing an audio stimulus to wake up the user,

wherein the radio frequency transmitter is also responsive to an incoming call from a network, and

wherein the radio signal is also for conveying audio from the call to the user during awake states of the user.

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9. The mobile terminal of claim 1, further comprising an awakening module arranged to create a sensory wake-up signal for waking up said user, in response to said stimulation signal.

20 10. The mobile terminal of claim 1, wherein the signal processing module is arranged for at least one of the following tasks:

preventing the user from falling into a deep sleep, so that the user remains in a shallow sleep,

turning off soothing sounds when the user falls from a shallow sleep into a deep sleep, and

causing room temperature to be adjusted before providing the stimulation signal for awakening the user.

11. The mobile terminal of claim 1, further comprising a snore monitoring unit, wherein the stimulation signal is for stopping the snoring.

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12. The mobile terminal of claim 1, wherein the signal processing module is configured to compute a ratio of deep sleep to shallow sleep, and to provide the stimulation signal if the ratio falls below a threshold, in order to prevent the user from sleeping too much.

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13. The mobile terminal of claim 1,
wherein the at least one sleep characteristic is recordable to form a sleep-wake history of the user, and
wherein the sleep-wake history is usable by the mobile terminal to advise the
10 user when to sleep.

14. The mobile terminal of claim 9, wherein the sensory wake-up signal is graduated for waking up said user gradually instead of suddenly.

15 15. The mobile terminal of claim 1, wherein the at least one sleep characteristic is indicative of a transition from REM to another sleep stage.

16. The mobile terminal of claim 15, wherein the stimulation signal is provided only within a certain period after the transition from REM.

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17. The mobile terminal of claim 1, wherein the at least one sleep characteristic is indicative of whether the user is in REM sleep.

18. The mobile terminal of claim 17, wherein the stimulation signal is provided
25 only in case the at least one sleep characteristic is indicative of REM sleep.

19. The mobile terminal of claim 1, further comprising a user interface for setting a desired wake-up interval or an end point of said interval.

30 20. An electronic monitor for monitoring a sleeping person, comprising:

at least one sensor responsive to at least one physiological manifestation that indicates a characteristic of sleep, the at least one sensor being for providing a sleep characterizing signal; and

5 a transmitter, responsive to the sleep characterizing signal, the transmitter being for providing a sleep descriptor signal to a terminal,
a receiver for receiving a stimulation signal, and
a stimulating unit.

21. An electronic monitor according to claim 20, wherein said stimulating unit is
10 a haptic stimulation device.

22. The electronic monitor of claim 20, wherein the at least one sensor includes at least part of a static charge sensitive bed.

15 23. An electronic device for bringing a user toward an awake state, said device comprising:

at least one sensor responsive to at least one physiological manifestation indicative of at least one sleep characteristic, wherein said at least one sensor is arranged to create a sleep characterizing signal representing said at least one sleep
20 characteristic,

a signal processing module for processing said sleep characterizing signal, wherein said signal processing module is arranged to detect a suitable instant for providing a stimulation signal that will cause the user to come toward the awake state, and

25 a stimulation module, responsive to the stimulation signal, for creating a jarring signal for bringing the user toward the awake state,

a receiver for receiving control data from another device, and
wherein said device is wearable on a human body.

30 24. An electronic device according to claim 23,

wherein said signal processing module is arranged to detect said suitable instant on the basis of at least one criterion, and

wherein said signal processing module is responsive to said control data by adjusting said at least one criterion.

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25. An electronic device according to claim 29 wherein said at least one criterion corresponds to a time interval.

26. An electronic device according to claim 23 wherein the signal processing
10 module is arranged to be adjustable according to data received by said receiver.

27. The electronic device according to claim 23, wherein said stimulation module is arranged to create an audio alarm or is arranged to create a vibration alarm or is arranged to create a visual alarm, or is arranged to create alternative or combined
15 types of alarms.

28. The electronic device according to claim 23, wherein said stimulation module is arranged to create the stimulation signal by prompting another electronic device via a wireless transmission.

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29. The electronic device of claim 23, wherein the electronic device is further arranged to optionally provide soothing sounds until the user falls past a threshold from shallow sleep into deep sleep.

25 30. The electronic device of claim 23, wherein the at least one sleep characteristic is indicative of a transition from REM to another sleep stage.

31. The electronic device of claim 30, wherein the stimulation signal is provided only within a certain period after the transition from REM.

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32. The electronic device of claim 23, wherein the at least one sleep characteristic is indicative of whether the user is in REM sleep.

33. The electronic device of claim 32, wherein the stimulation signal is provided only in case the at least one sleep characteristic is indicative of REM sleep.

34. The electronic device of claim 23, further comprising a user interface for setting a desired wake-up interval.

35. A system for bringing a user of a mobile terminal toward an awake state, comprising:

at least one sensor responsive to at least one physiological manifestation that indicates a characteristic of sleep, the at least one sensor being for providing a sleep characterizing signal;

a transmitter, responsive to the sleep characterizing signal, the transmitter being for providing a sleep descriptor signal to the mobile terminal;

a receiver at the mobile terminal for receiving the sleep descriptor signal;

and

a signal processing module at the mobile terminal for processing said sleep descriptor signal,

wherein said signal processing module is arranged to provide, at least partly in response to the sleep descriptor signal, a stimulation signal indicative that the user should be stimulated toward the awake state, and

wherein the mobile terminal is also usable by the user in the awake state, for communication purposes.

36. A method for determining when a user should be stimulated toward an awake state, comprising:

receiving a sleep descriptor signal indicative of at least one sleep characteristic of the user;

processing said sleep descriptor signal, and

providing, at least partly in response to the sleep descriptor signal, a stimulation signal,

wherein the method is performed within a mobile terminal that is also usable for communication by the user in the awake state.

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37. The method of claim 36, further comprising the step of transmitting a polling signal before said receiving of the sleep descriptor.

38. The method of claim 36, comprising:

10 determining on at least two instants in time whether the user is in REM sleep or NREM sleep on the basis of at least one of said received sleep descriptor signal, storing determination information regarding an outcome of said determining step,

15 detecting a transition from REM sleep to NREM sleep based upon said determination information, and providing said stimulation signal as a response to said detecting step.

39. The method of claim 36 wherein said stimulation signal is an audible signal.

20 40. The method of claim 36 wherein said stimulation signal is a radio signal for activating a stimulating unit.

41. The method of claim 36 wherein said stimulation signal is provided at least partly on the basis of at least one criterion adjustable by the user.

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42. The method of claim 36, wherein an incoming call is handled at least partly depending upon the at least one sleep characteristic indicative of whether the user is in a deep sleep or a shallow sleep, giving the user protection from being awoken out of the deep sleep.

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43. The method of claim 36, further comprising the step of indicating to at least one other person whether the user is awake or in a deep sleep or a shallow sleep, based at least partly on the at least one sleep characteristic.

5 44. The method of claim 36, further comprising the step of providing to at least one other person an estimated time until the user will arrive at a suitable awakening point from a deep sleep, based at least partly on the at least one sleep characteristic.

45. The method of claim 36, further comprising the step of providing a radio
10 signal, in response to the stimulation signal, for contributing to causing said user to be awoken,

wherein the radio signal triggers an audio stimulus to wake up the user,

wherein providing the radio signal is also responsive to an incoming call
from a network, and

15 wherein the radio signal is also for conveying audio from the call to the user during awake states of the user.

46. The method of claim 36, further comprising the step of creating a sensory
wake-up signal for waking up said user, in response to said stimulation signal.

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47. The method of claim 36, wherein the processing step is for doing at least one of the following tasks:

preventing the user from falling into a deep sleep, so that the user remains in a shallow sleep,

25 turning off soothing sounds when the user falls from a shallow sleep into a deep sleep, and

causing room temperature to be adjusted before providing the stimulation signal for awakening the user.

30 48. The method of claim 36, wherein the processing step includes computing a ratio of deep sleep to shallow sleep, and wherein the stimulation signal is provided

if the ratio falls below a threshold, in order to prevent the user from sleeping too much.

49. The method of claim 36, further comprising the steps of:

5 recording the at least one sleep characteristic to form a sleep-wake history of the user,

wherein the sleep-wake history is usable to advise the user when to sleep.

50. The method of claim 36, wherein the at least one sleep characteristic is
10 indicative of a transition from REM to another sleep stage.

51. The method of claim 36, wherein the at least one sleep characteristic is indicative of whether the user is in REM sleep.

15 52. The method of claim 36, further comprising the step of setting a desired wake-up interval.

53. A computer-readable medium, the medium being encoded with a software data structure for performing the method of claim 36.

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54. The computer-readable medium of claim 53, further comprising software for providing a polling signal before said receiving of the sleep descriptor.

55. The computer-readable medium of claim 53, further comprising software for:

25 determining on at least two instants in time whether the user is in REM sleep or NREM sleep on the basis of at least one of said received sleep descriptor signal, storing determination information regarding an outcome of said determining step,

detecting a transition from REM sleep to NREM sleep based upon said
30 determination information, and

providing said stimulation signal as a response to said detecting step.

56. A computer-readable medium for use in a mobile terminal, the medium being encoded with a software data structure for determining, based at least upon a sleep descriptor signal, when to stimulate a person to bring the person toward an awake state.

57. The computer-readable medium of claim 56, wherein an audible signal is for stimulating the person toward the awake state.

58. The computer-readable medium of claim 56 wherein a radio signal is for activating a stimulating unit to stimulate the person toward the awake state.

59. The computer-readable medium of claim 56 wherein the person is stimulated at least partly on the basis of at least one criterion adjustable by the person.

60. The computer-readable medium of claim 56,
wherein an incoming call is handled at least partly depending upon whether the user is in a deep sleep or a shallow sleep, to give the user protection from being awoken out of the deep sleep.

61. The computer-readable medium of claim 56, wherein the software is also for arranging a polling signal before said sleep descriptor is provided.

62. The computer-readable medium of claim 56, wherein the software is also for:
evaluating on at least two instants in time whether the person is in REM sleep or NREM sleep, on the basis of at least one of said sleep descriptor signal, detecting a transition from REM sleep to NREM sleep based upon said evaluating step, and stimulating the person in response to said detecting step.